CLAIMS

What is claimed is:

1. A tissue cutting device, comprising:

a probe defining a probe axis;

a cutting loop configured to be in one of a storage configuration and a cutting configuration; and

a loop holder defining a loop holder axis generally orthogonal to the probe axis, the loop holder being configured to hold and to rotate the cutting loop about the loop holder axis when the cutting loop is in the cutting configuration so as to adjust a loop angle defined between the probe axis and the cutting loop.

2. The tissue cutting device of claim 1, wherein the probe includes a probe cover slidable along the probe axis and having a distal position in which the probe cover houses at least part of the loop holder and the cutting loop in the storage configuration and a proximal position in which at least part of the loop holder and the cutting loop are external to the probe cover and in which the cutting loop is in the cutting configuration.

3. The tissue cutting device of claim 1, wherein the cutting loop is configured in the storage configuration when retracted into the probe and when extended from a distal region of the probe, the cutting loop generally returning to a cutting configuration from the storage configuration.

4. The tissue cutting device of claim 1, further comprising a handle coupled to a proximal region of the probe, the handle housing a loop controller for at least one of selectively extending the cutting loop to the cutting configuration out of the probe and retracting the cutting loop to the storage configuration within the probe, and selectively rotating the loop holder and the cutting loop when the cutting loop is in the cutting configuration.

5. The tissue cutting device of claim 1, wherein the cutting loop has at least one of high elasticity, shape memory property and superelastic property.

6. The tissue cutting device of claim 1, wherein the cutting loop has a first edge and a second edge and wherein the first edge is one of longer than, equal in length to, and shorter than the second edge.

7. The tissue cutting device of claim 1, wherein the cutting loop has a first edge and a second edge and wherein at least one of the edges is at least one of pointed, flat, rounded, dull, sharpened, continuously serrated, intermittently serrated, regularly serrated, and irregularly serrated.

8. The tissue cutting device of claim 1, further comprising a loop width adjuster disposed in at least one of the loop holder and the probe, the loop width adjuster being configured to adjust a width of the cutting loop.

9. The tissue cutting device of claim 8, wherein the loop width adjuster is pivotable about a pivot, whereupon pivoting the loop width adjuster about the pivot adjusts the width of the cutting loop.

10. The tissue cutting device of claim 1, further comprising a loop length adjuster disposed in at least one of the loop holder and the probe, the loop length adjuster being configured to adjust a length of the cutting loop.

11. The tissue cutting device of claim 10, wherein the loop length adjuster includes a cutting loop winder configured to at least one of wind and unwind a length of the cutting loop to shorten and lengthen, respectively, the length of the cutting loop exterior to the loop holder.

12. The tissue cutting device of claim 1, wherein the cutting loop is fixedly attached to the loop holder.

13. The tissue cutting device of claim 1, further comprising a tissue collector coupled to at least one of the probe, the loop holder and the cutting loop.

14. The tissue cutting device of claim 13, wherein the tissue collector is adapted to collect tissue at least one of as the tissue is severed by the cutting loop and after the tissue is severed by the cutting loop.

15. The tissue cutting device of claim 1, further comprising an energy source operatively coupled to the cutting loop.

16. The tissue cutting device of claim 15, wherein energy provided by the energy source is selected from the group consisting of radio frequency, laser, ultrasound, heat, cold, oscillation, vibration, rotation, liquid pressure and gas pressure.

17. The tissue cutting device of claim 16, wherein the radio frequency energy source is configured to apply a current to the cutting loop and wherein the cutting loop is at least partially insulated to concentrate the current on a portion thereof.

18. The tissue cutting device of claim 16, wherein the rotation or oscillation is generally in a direction orthogonal to the probe axis.

19. The tissue cutting device of claim 18, further comprising at least one gear disposed in at least one of the loop holder and the probe, the at least one gear being configured to at least one of rotate and oscillate the cutting loop.

20. The tissue cutting device of claim 1, wherein the cutting loop includes a metallic material selected from the group consisting of a metal, a metal alloy, a metal laminate, and a metal composite.

21. The tissue cutting device of claim 20, wherein the metallic material is one of titanium, titanium alloy, nickel-titanium alloy, nickel-chromium alloy, chromium-nickel alloy, cobalt chromium-nickel alloy and iron-chromium alloy.

22. The tissue cutting device of claim 20, wherein the cutting loop includes at least one additional material to provide at least one of electrical insulation, heat insulation, electrical conductivity, heat conductivity, strength, lubricity, and sensor.

23. The tissue cutting device of claim 22, wherein the at least one additional material is selected from the group consisting of ceramics, polymers, plastics, metals, metal alloys, glass, diamonds, diamond-like carbon, and metal-doped diamond noncomposite coating, and nonmetal-doped diamond noncomposite coating.

24. The tissue cutting device of claim 1, wherein the probe includes at least one accessory channel.

25. The tissue cutting device of claim 24, wherein the at least one accessory lumen includes at least one of a transport lumen configured to transport a material to be to a distal end of the probe and a vacuum lumen operatively connected to a vacuum source.

26. The tissue cutting device of claim 1, wherein the cutting loop includes a plurality of loops.

27. The tissue cutting device of claim 26, wherein the plurality of loops of the cutting loop move relative to each other by at least one of rotating and oscillating.

28. A device, comprising a tissue cutting device configured to cut an asymmetric volume of tissue.

29. The device of claim 28, wherein the tissue cutting device includes a probe defining a probe axis, a cutting loop configured to be in one of a storage configuration and a cutting configuration, and a loop holder configured to hold and to rotate the cutting loop about a loop holder orthogonal to the probe axis when the cutting loop is in the cutting configuration, and wherein the asymmetric volume of tissue is cut by the loop holder rotating the cutting loop to adjust the loop angle upon returning the cutting loop from the storage configuration to the cutting configuration, by moving the tissue cutting device generally along the probe axis, and by the loop holder rotating the cutting loop again so the loop angle is approximately 0° to complete the cut of the asymmetric volume of tissue.

30. A tissue cutting method, comprising:

positioning a distal region of a probe of a tissue cutting device adjacent to a volume of tissue to be excised, the probe defining a probe axis;

returning a cutting loop to a cutting configuration from a storage configuration;

rotating a loop holder to rotate the cutting loop attached thereto about a loop holder axis defined by the loop holder, the loop holder axis being generally orthogonal to the probe axis, the rotating adjusts a loop angle defined between the probe axis and the cutting loop; and

moving the tissue cutting device such that the cutting loop cuts the volume of tissue.

31. The tissue cutting method of claim 30, wherein returning the cutting loop to the cutting configuration from the storage configuration includes extending the cutting loop from a distal region of the probe.

32. The tissue cutting method of claim 30, further comprising:

identifying a lesion; and

estimating the volume to tissue to be excised based on the identified lesion;

33. The tissue cutting method of claim 30, wherein the rotating positions the cutting loop to at least partially encircle the volume of tissue.

34. The tissue cutting method of claim 30, wherein the moving is along the probe axis.

35. The tissue cutting method of claim 30, further comprising after the moving, rotating the loop holder about the loop holder axis to rotate the cutting loop to complete cutting of the volume of tissue.

36. The tissue cutting method of claim 30, wherein at least one of the extending and rotating is via a loop controller on a handle coupled to a proximal region of the probe.

37. The tissue cutting method of claim 30, wherein the cutting loop has at least one of shape memory property, superelastic property, and high elasticity.

38. The tissue cutting method of claim 30, wherein the cutting loop has a first edge and a second edge and wherein the first edge is one of longer than, equal in length to, and shorter than the second edge.

39. The tissue cutting method of claim 30, wherein the cutting loop has a first edge and a second edge and wherein at least one of the edges is at least one of pointed, flat, rounded, dull, sharpened, continuously serrated, intermittently serrated, regularly serrated, and irregularly serrated.

40. The tissue cutting method of claim 30, further comprising adjusting a width of the cutting loop after the extending.

41. The tissue cutting method of claim 40, wherein the cutting loop width adjusting includes pivoting a loop width adjuster about a pivot.

42. The tissue cutting method of claim 30, further comprising adjusting a length of the cutting loop length exterior to the loop holder after the extending.

43. The tissue cutting method of claim 42, wherein the cutting loop length adjusting includes at least one of winding and unwinding the cutting loop onto and off of a cutting loop winder.

44. The tissue cutting method of claim 30, wherein the cutting loop is fixedly attached to the loop holder.

45. The tissue cutting method of claim 30, further comprising collecting the volume of tissue in a tissue collector coupled to at least one of the probe, the loop holder and the cutting loop.

46. The tissue cutting method of claim 45, wherein the collecting is at least one of during the moving of the tissue cutting device and after the moving of the tissue cutting device.

47. The tissue cutting method of claim 30, further comprising applying an energy to the cutting loop.

48. The tissue cutting method of claim 47, wherein the energy is selected from the group consisting of radio frequency, laser, ultrasound, heat, cold, oscillation, vibration, rotation, liquid pressure and gas pressure.

49. The tissue cutting method of claim 48, further comprising applying a radiofrequency current to the cutting loop, wherein the cutting loop is at least partially insulated to concentrate the radiofrequency current on a portion thereof.

50. The tissue cutting method of claim 48, further comprising at least one of rotating and oscillating the cutting loop by actuating a gear coupled to the cutting loop.

51. The tissue cutting method of claim 30, wherein the cutting loop includes an electrically conductive material.

52. The tissue cutting method of claim 51, wherein the electrically conductive material is a metallic material selected from the group consisting of a metal, a metal alloy, a metal laminate, and a metal composite.

53. The tissue cutting method of claim 52, wherein the metallic material is one of titanium, titanium alloy, nickel-titanium alloy, nickel-chromium alloy, and iron-chromium alloy.

54. The tissue cutting method of claim 30, further comprising delivering a material to a distal region of the probe via an accessory lumen of the probe.

55. The tissue cutting method of claim 30, further comprising applying vacuum to a distal region of the probe via a vacuum lumen of the probe operatively coupled to a vacuum source.

56. The tissue cutting method of claim 30, wherein the volume of tissue is an asymmetric volume of tissue.

57. The tissue cutting method of claim 30, further comprising:

rotating the loop holder after the moving to rotate the cutting loop about the loop holder axis so that the loop angle is approximately 0° or 180° to complete the cut of the asymmetric volume of tissue.

58. The tissue cutting method of claim 30, further comprising, during the moving the tissue cutting device, moving a plurality of loops of the cutting loop relative to each other, the moving the plurality of loops being at least one of rotating and oscillating.

59. The tissue cutting method of claim 30, wherein the returning the cutting loop to the cutting configuration from the storage configuration includes sliding a probe cover of the probe in a proximal direction from a distal position in which the probe cover houses at least part of the loop holder and the cutting loop in the storage configuration to a proximal position in which the cutting loop extends from a distal end of the probe cover returns to the cutting configuration.

60. The tissue cutting method of claim 59, further comprising:

positioning a sheath in the tissue;

engaging a proximal end of the sheath to a distal end of the probe cover; and

pushing at least part of the probe through a distal region of the probe cover and into the sheath until at least the cutting loop is distal to a distal end of the sheath and the cutting loop returns to the cutting configuration.

61. The tissue cutting method of claim 60, further comprising:

positioning a distal end of a guide adjacent to the volume of tissue;

enlarging a track in the tissue around the guide by sliding a dilator and the sheath over the guide; and

removing at least the dilator, leaving at least the sheath in place.